

KAWAI et al.
Appl. No. (To be Assigned)
(Division of USSN 10/139,639)
November 25, 2003

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Claim 1 - cancelled.

2. (Original) An ignition coil for an internal combustion engine comprising:
a resin spool formed in a substantially cylindrical shape;
a coil constituted by a coil winding wound around said spool; and
a high electric voltage being supplied to an ignition apparatus in the internal combustion engine,

wherein a projection portion protruding to an outer side in a diametrical direction from an outer peripheral surface of the spool and assembled in said spool after being separately formed from said spool is provided in an end portion in an axial direction on the outer peripheral surface of said spool.

3. (Original) An ignition coil for an internal combustion engine comprising:
a resin spool formed in a substantially cylindrical shape;
a coil constituted by a coil winding wound around said spool;

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a high electric voltage being supplied to an ignition apparatus in the internal combustion engine; and

a resin material having an electric insulating property being charged into a substantially cylindrical housing receiving said coil and said spool, whereby said coil and said spool are molded and fixed,

wherein at least a portion corresponding to said coil in said spool has an inner tube portion and an outer tube portion so as to form a double cylinder structure, a projection portion protruding to an outer side in a diametrical direction is formed in an end portion in an axial direction of said outer tube portion, and an adhesive strength between said resin material and said outer tube portion is smaller than an adhesive strength between said resin material and said inner tube portion.

4. (Original) An ignition coil for an internal engine comprising:
a resin spool formed in a substantially cylindrical shape;
a coil constituted by a coil winding wound around said spool;
a high electric voltage being supplied to an ignition apparatus in the internal combustion engine; and

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a resin material having an electric insulating property being charged into a substantially cylindrical housing receiving said coil and said spool, whereby said coil and said spool are molded and fixed,

wherein an adhesion restraining film which restrains an adhesion between an outer peripheral surface of said spool and said coil winding by said resin material is provided between the outer peripheral surface of said spool and said coil winding, and a distance (r_2) from said adhesion restraining film in an end portion side in an axial direction of said spool to a center axis of the spool is larger than a distance (r_1) from said adhesion restraining film in a substantially center portion in the axial direction of said spool to the center axis of said spool.

5. (Original) An ignition coil for an internal combustion engine comprising:
a primary coil and a secondary coil which are coaxially arranged;
a center core inserted to axial core portions in both of said coils;
an outer peripheral core arranged in an outer peripheral side of both of said coils;
a substantially cylindrical housing receiving both of said coils and both of said cores; and

a resin material having an electric insulating property being charged into said housing, whereby both of said coils and both of said cores are molded and fixed,

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wherein a slit dividing a part of the outer peripheral coil and extending in a longitudinal direction is provided in said outer peripheral core.

6. (Original) An ignition coil for an internal combustion engine comprising:
an integrally formed resin spool and a coil constituted by a coil winding wound around said spool; and

a high electric voltage being supplied to an ignition apparatus in the internal combustion engine,

wherein said spool is provided with a cylinder portion around which said coil is wound, a collar portion protruding to an outer side in a diametrical direction from an end side outer peripheral surface of said portion so as to form a circumferential shape, and a reinforcing portion connected to said collar portion, extending in an axial direction of said cylinder portion and reinforcing said collar portion, and

wherein a ratio of thickness (t/t_0) of a thickness (t) of said collar portion and/or the reinforcing portion with respect to a thickness (t_0) of said cylinder portion is equal to or less than 1.5.

7. (Original) The ignition coil for an internal combustion engine as claimed in claim 6, wherein said ratio of thickness (t/t_0) is equal to or less than 0.1.

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8. (Original) The ignition coil for an internal combustion engine as claimed in claim 6, wherein said reinforcing portion is extended from a substantially center of said collar portion and form a substantially T shape with said collar portion.

9. (Original) The ignition coil for an internal combustion engine as claimed in claim 6, wherein said reinforcing portion is extended from both end sides of said collar portion and form a substantially U shape with said collar portion.

10. (Original) An ignition coil for an internal combustion engine comprising:
a coil around which a coil winding is wound;
a resin spool having a cylinder portion around which the coil winding of said coil is wound, and a collar portion protruding to an outer side in a diametrical direction from an outer peripheral surface of said cylinder portion so as to form a circumferential shape and being capable of holding an end portion of said coil; and

a high electric voltage being supplied to an ignition apparatus in the internal combustion engine,

wherein an elastic member is provided at least in the coil winding side of said coil connected to said collar portion from said cylinder portion.

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11. (Original) The ignition coil for an internal combustion engine as claimed in claim 10, wherein said elastic member is an elastic film coated on said spool.

12. (Original) The ignition coil for an internal combustion engine as claimed in claim 10, wherein said elastic member is an elastic film which is integrally formed with said spool.

13. (Original) An ignition coil for an internal combustion engine comprising:
a coil in which a coil winding is wound around a substantially cylindrical spool;
and

a high electric voltage being supplied to an ignition apparatus in the internal combustion engine,

wherein said spool has a cylinder portion, and a collar portion capable of holding an end portion of said coil formed so as to protrude in an outer side in a diametrical direction from an outer peripheral surface of said cylinder portion so as to form a circumferential shape by winding an elastic sheet having linearly arranged projections around said cylinder portion.

14. (Original) An ignition coil for an internal combustion engine comprising:

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a coil in which a coil winding is wound around a substantially cylindrical spool;
and

a high electric voltage being supplied to an ignition apparatus in the internal
combustion engine,

wherein said spool is constructed by inserting and fitting an outer tube portion
constituted by an elastic member to an inner tube portion, said outer tube portion has a
cylinder portion around which a coil winding of said coil is wound, and a collar portion
protruding to an outer side in a diametrical direction from an outer peripheral surface of
said cylinder portion so as to form a circumferential shape and capable of holding an end
portion of said coil.

15. (Original) An ignition coil for an internal combustion engine comprising:
a spool formed in a substantially cylindrical shape and having a projection portion
arranged in one end portion in an axial direction of an outer peripheral surface;
a coil annularly provided in said spool and having one end constituted by a coil
winding held by said projection portion;
an adhesion restraining film interposed between said spool and said coil winding
and restraining an adhesion between the outer peripheral surface of said spool and said
coil winding; and

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a high electric voltage being supplied to an ignition apparatus in the internal combustion engine,

wherein the ignition coil further has a post-provided collar portion which is annularly provided in said adhesion restraining film at another end portion in an axial direction of the outer peripheral surface of said spool and holding another end of said coil.

16. (Original) An ignition coil for an internal combustion engine comprising:
a spool formed in a substantially cylindrical shape and having a projection portion arranged in one end portion in an axial direction of an outer peripheral surface;

a coil annularly provided in said spool and having one end constituted by a coil winding held by said projection portion;

an adhesion restraining film interposed between said spool and said coil winding and restraining an adhesion between the outer peripheral surface of said spool and said coil winding; and

a high electric voltage being supplied to an ignition apparatus in the internal combustion engine,

wherein said coil winding is a self welding coil winding, and said coil is a shape keeping coil capable of keeping a shape by itself.